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ENVIRONMENT

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EARTH
DAY
21
APRIL 22

FROM THE ENDS OF THE EARTH TO THE END OF THE BLOCK

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Features

Departments

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Editor's Note

I RECENTLY RAN ACROSS a familiar Psalm that seemed like a suitable Earth Day thought for environmentalists:

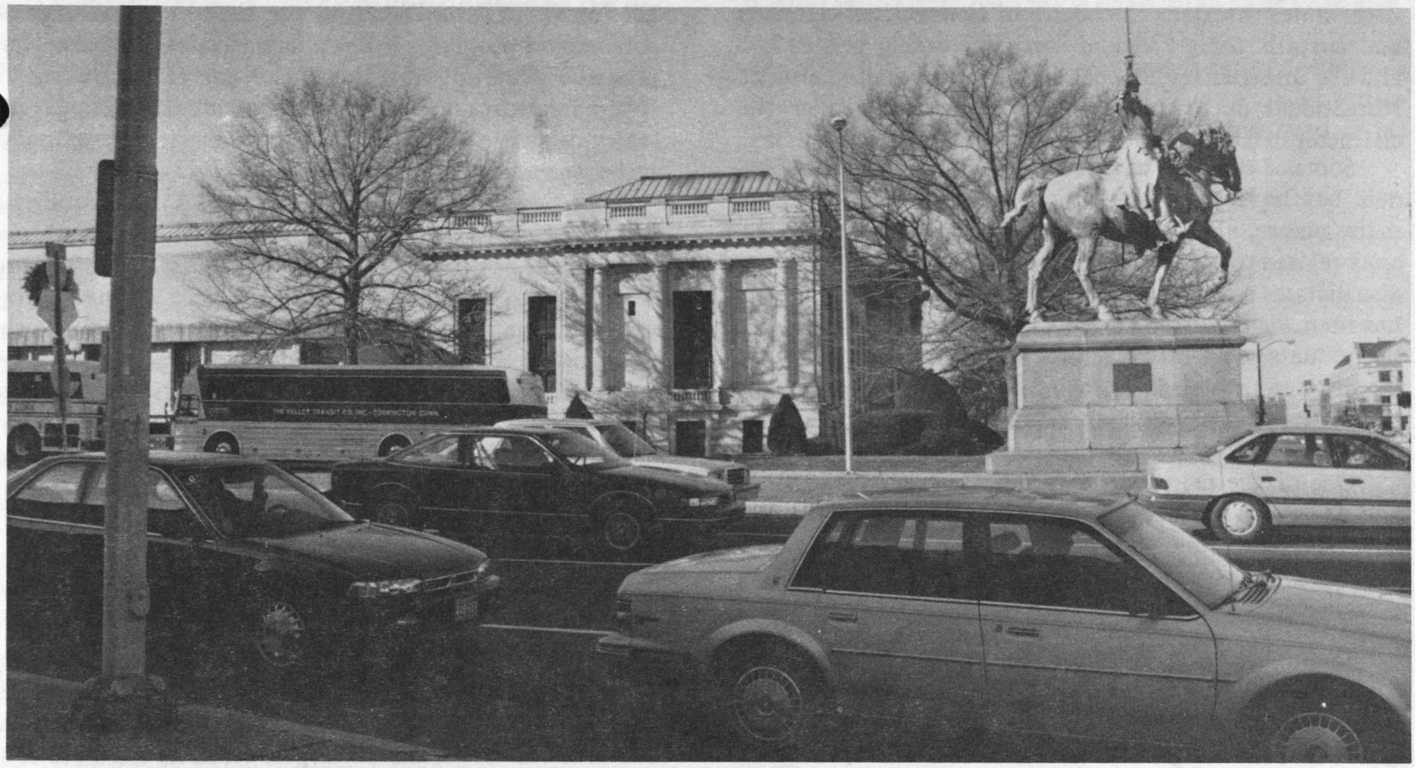
Yet thou hast made him little less than God,
and dost crown him with glory and honor,
Thou hast given him dominion over the works of thy hands;
thou hast put all things under his feet;
all sheep and oxen, and also the beasts of the field,
the birds of the air, and the fish of the sea,
whatever passes along the paths of the sea. (Psalm 8.5-6, 7-8)

Then I had to ask, "Is it saying what I expected, what I wanted to read?" Its ancient author's focus was, according to the gloss in one translation, "the munificence of the creator." More modern readers, in particular, have laid more emphasis on man's power and "dominion." Is that the message?

April 22nd is the 21st anniversary of Earth Day. We have, I think, moved a step further around the circle. The view that nature is *ours for the taking* -- the "pillage and plunder" approach to earth -- has, at least in some parts, taken a step backwards before the view that the earth is ours *to take care of*. Which is not a wholly new view!

Much of what we offer, this month, has, appropriately, to do with man's effects ... on the local landscape and the larger earth ... and with how, at a variety of levels, we're trying to moderate these effects. Happy Earth Day.

M.C.



Current-day transportation is leaving more of a mark on our landscape than an occasional equestrian statue. Here, the Marquis de La Fayette and others head toward State Capitol. (Photo: Rosemary Gutbrod)

Land Use and Transportation

Getting there Is Half (or More) of the Problem

from **The Annual Report of the Council on Environmental Quality**

SOME OF THE MOST SERIOUS ENVIRONMENTAL problems threatening the citizens of Connecticut are caused by diffuse land development. If current trends are permitted to continue, projections through 2010 predict continued decentralization of employment, housing, and commercial activity. Diffuse residential and commercial areas sprawl over the landscape, necessitating automobile use which in turn inhibits the state's ability to attain healthful air quality.

Connecticut residents, like most Americans, will drive more miles this year than they did in 1970, 1980, or even last year. Among the consequences are environmental, social, and economic problems, including an air pollution problem that will prove extremely difficult to solve, despite the 1990 federal Clean Air Act mandate to do so.

Karl Wagener, Executive Director of the Council on Environmental Quality, will be one of three panelists discussing "Transportation Impacts on the Land" at DEP's annual Environment/2000 conference, April 19th. The conference this year will focus on "Conservation of Connecticut's Land Resources."

Do we drive and pollute more each year because we prefer to, or because land-use, transportation, and other types of public policy have forced us to be automobile dependent? Trends in land development throughout Connecticut leave more and more residents with no options for personal mobility aside from automobile use. Only one fourth of all work trips are accessible to transit.

Today's transportation and land-use patterns developed when roads were less congested and households generated fewer daily automobile trips. They are becoming obsolete in view of demographic patterns and environmental realities.

Failing to overhaul state and local land-use and transportation policy could doom the state to ever-increasing automobile use, leaving residents exposed to significant economic, environmental, and social costs.

Many of the costs of diffuse development are "hidden," in that they are not accounted for in the price of land or its development, or in the cost of gasoline. Automobile-dependent development makes employment, recreation, and shopping areas inaccessible to members of the population that do not drive; the automobile use it

necessitates threatens the health of Connecticut's citizens and curtails their freedom with increasing congestion; and the unnecessary loss of land it causes makes outdoor recreational opportunities more remote and turns the character of the state's landscape into a fading memory.

Some of the costs of diffuse development are not hidden, but have clear economic price tags. The building, maintenance, and expansion of highways have obvious costs related to the rise in automobile use. Automobile use also dictates our reliance on petroleum, the cost of which has been made all too clear in recent months, and forces individuals to spend more on transportation, due to the inability to provide transit to diffusely developed areas. In addition, diffuse development saps economic life from cities and can drive up the costs of housing and land.

One of the principal causes of diffuse development and its costs is *the lack of coordination between land-use and transportation policy at all levels of government.* This one weakness is at the root of many of the most serious environmental problems faced by the state today.

LAND USE AND TRANSPORTATION are inextricably linked. When the two types of policy are not coordinated, sprawl results. Large lot subdivisions, for example, create neighborhoods too diffuse to be conducive to transit. Similarly, office parks situated away from public transit lines effectively require employees to drive to work. The result, then, of forming land-use policy without keeping transportation in mind causes the growth of towns where residents are totally dependent on the automobile.

The relationship between land-use and transportation policy works in the other direction as well. Transportation policy favors automobile use by, for example, funding the expansion of rural roads to serve new employers. The result of this policy is that employers can move to cheaper sites out of the city because employees can travel to work by car. The result is that people, again, are entirely dependent on their cars, commuting from the suburb in which they live to the suburb in which they work.

The relationship between land-use and transportation policy, then, is one which, if not coordinated, causes patterns of development that are detrimental to the public. Coordination of transportation and land use, however, is within reach. Connecticut can choose to continue along the road to increasing land loss and congestion, or it can build more efficient communities.

While population increases and economic growth do not necessarily result in sprawl, inadequate policy coordination does. Partly because of outmoded zoning ordinances and public policies, land development is growing 50 percent faster than population. Alternative future landscapes are possible, but each requires different choices to be made. (In the Seattle, Washington, area, residents were actually invited to vote for their future landscape, and selected something quite different from current trends.)

State government in Connecticut shies away from making those choices, opting instead to serve private market forces. That decision and the current assemblage of policies and programs are not laissez-faire, however, but present a government-selected alternative for the state's future landscape. Through grants, construction, and regulatory decisions, state agencies routinely, if unwittingly, encourage and tolerate suburban sprawl.

The Council has explored the state's responsibilities and opportunities to guide transportation and land use. Many of the necessary policies already exist, and planning takes place at the local, regional, and state levels of government. The creation of an entirely new planning process is not necessary. The challenge is to find a means for integrating transportation and land use policies at all levels of government to accommodate economic growth, enhance personal mobility, and reduce the environmental consequences of sprawl.

ECONOMIC EFFECTS OF SPRAWL

THE DECLINE OF CITIES: ONE OF THE MOST obvious costs of sprawl – though one that does not affect all residents equally is the draining of commercial life from our cities. In 1970, the 10 largest cities in the state contained 46 percent of the state's jobs; by 2010, that figure is projected to drop to 39 percent. Three of four new non-rural jobs have been located in suburbs since 1950.

HIGHWAY IMPROVEMENTS: SPRAWL IS BASED on automobile use, which requires building, maintaining, cleaning, plowing, and policing roads. The costs involved are passed on to the public. While the State Traffic Commission (STC) often requires large traffic generators to pay for the construction of road improvements to ease traffic flow, the obscure costs of siting those generators in diffuse suburban locations include congested roads which the taxpaying public must ultimately maintain.

Two outstanding examples of sprawl's public costs are the improvements being planned in the I-91 and I-95 highway corridors. These highways, conceived for intercity travel, are cluttered by both suburban-to-urban commuters and suburb-to-suburb commuters. The reason that transit alone is not sufficient to reduce congestion is that neither the jobs nor the homes are concentrated enough to support much additional transit.

CONGESTION: CONGESTION HAS COSTS of its own, beyond the impacts to human health: the clogged road network is an impediment to attracting new businesses and to the transportation of goods and employees. Unless current trends are altered, the congestion on highways will worsen. By the year 2010, 43 percent of the state's expressways will suffer congestion with traffic speeds of less than 35 miles per hour. The 1990 *Statewide Transit System Plan* found that population and employment are growing in different locations, so that daily vehicle miles traveled (VMT's), which increased 62 percent in the last 20 years, will continue to increase in the future. In Fair-

field County, the high cost of housing heightens the demand for automobile travel, as employees must seek housing in distant towns where it can be afforded.

THE DIFFICULTY OF PROVIDING TRANSIT: Sprawl costs each town money when school and elderly transport services are spread out. In addition, individuals spend more on transportation than they would like because they have no transportation options; municipal land-use regulations have diffused residential, commercial, employment, and recreation areas, creating densities too low for transit service and leaving residents automobile-dependent for virtually all activities.

The Connecticut DOT notes in its *Statewide Transit System Plan* of 1990 that suburb-to-suburb commuting is the fastest-growing component of commuter traffic. While a balance of employment and housing is good for a community, and one possible result may be shorter commutes for suburbanites, more often the actual result is that suburbanites do not live and work in the same area and must travel greater distances in a pattern not conducive to mass transit.

LAND SCARCITY AND RISING COSTS: Many zoning regulations, such as large minimum lot size requirements, are wasteful of land and contribute to higher housing costs than actually necessary to preserve environmental quality and provide suburban amenities. For people of modest means, home ownership may be unnecessarily expensive near their place of employment, necessitating their locating in distant towns or fringe areas, a move which only increases sprawl and road congestion. Also, as more land is subdivided than is necessary to support housing, Connecticut's few industries harvesting renewable natural resources -- forestry, agriculture, commercial fishing -- find it difficult to retain accsss to the land they need.

ENVIRONMENTAL COSTS OF SPRAWL

AIR ... THE 1990 FEDERAL CLEAN AIR ACT amendments call for the classification of certain regions of Connecticut as "severe" or "serious" non-attainment areas for ground-level ozone, commonly known as "smog": most of the state is expected to be so classified. This automobile-generated pollution is the only air pollutant that Connecticut has not brought under control. All other pollutants meet health-based air quality standards. The reason for the continued violation of the one-hour ozone standard is simple: even as individual cars are producing fewer pollutants per mile traveled, the total increase in traffic compensates for each individual car's improvements. Current trends in vehicle miles traveled will offset the 50 percent tailpipe emissions improvements mandated by the U.S. Congress in 1990.

The increase in vehicular traffic is not unique to Connecticut; as a corridor state, Connecticut receives the air pollution from automobiles passing through the state, as well as from vehicles in the metropolitan New York area. On summer days, New York's emissions can contribute significantly to Connecticut's air quality problems. Nonetheless, Connecticut automobiles are a major source of southern New England's regional ground-level ozone problem.

WATER ... A 1974 STUDY, *The Costs of Sprawl*, conducted for several federal agencies, concluded that total water pollution (primarily runoff) from compact development is less than from sprawling development.

WILDLIFE ... THE EFFECT OF SPRAWLING development on wildlife is usually not detected by the casual observer, but is regarded by most wildlife experts as the most important threat to Connecticut's biological diversity. New residents of suburban fringe areas are often delighted by the abundance of birds and mammals near their homes. As development continues, however, only the visible, human-tolerant "edge" species survive. While deer, raccoons, rabbits, and common songbirds continue to delight residents, few notice the decline of woodland-nesting birds that cannot tolerate the intrusion of edge habitats. For wildlife conservation, ideal development would include large, unbroken woodland tracts sufficient in size to harbor thrushes, vireos, and other woodland inhabitants, in addition to the more common chickadees, cardinals, and finches.

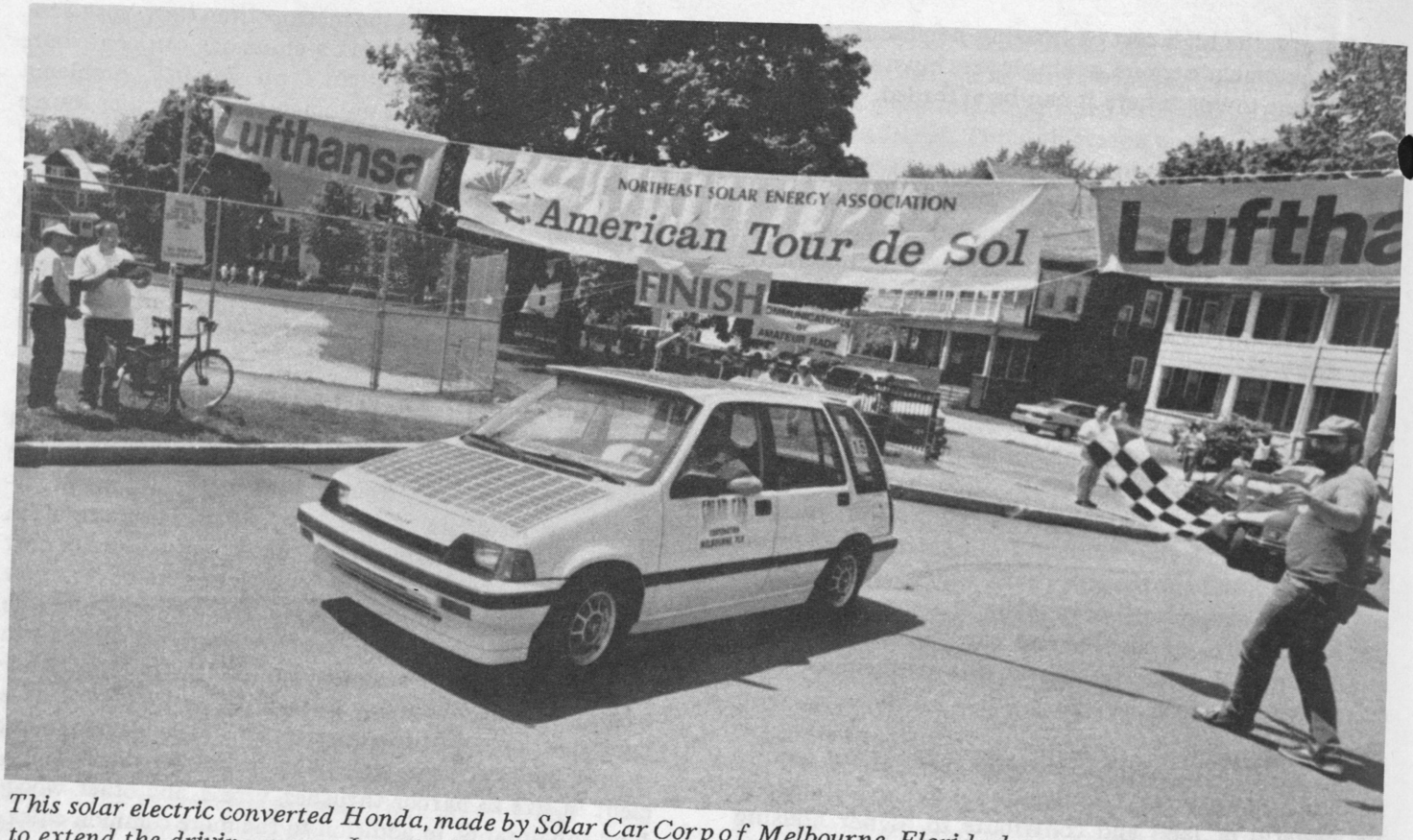
QUALITY OF LIFE

LOSS OF MOBILITY ... BEYOND THE OBVIOUS loss of mobility caused by the congestion inherent in sprawling development, automobile-based communities restrict the freedom of those residents who cannot or do not wish to drive, particularly the elderly and children.

LOSS OF LANDSCAPE AND SENSE OF PLACE ... Standardization of subdivision and zoning regulations, based on common, automobile-oriented, engineering principles, is yielding a homogeneous landscape. Roads and buildings are characterized by sameness. The New Eng1and landscape is being lost, not to the actions of private property owners who do what they wish with their land, but to the actions of private landowners who, when developing, must adhere to outdated planning snd zoning regulations.

ENERGY IMPACTS OF SPRAWL

SUBURBAN SPRAWL SPREADS WITH NO REGARD for the future. Connecticut's transportation system, necessitated by the state's development patterns, is almost entirely dependent on oil, supplies of which are limited. But alternatives to petroleum, if they become available, are likely to be expensive. Despite improved fuel efficiency of newer cars -- 50 percent more efficient in 1988 than in 1973 -- Connecticut drivers have reached an all-time high in gasoline consumption (1.5 billion gallons annually).■



This solar electric converted Honda, made by Solar Car Corp of Melbourne, Florida, has a gasoline powered generator to extend the driving range. It took first place in the 1990 American Tour de Sol Solar and Electric Car Championships, in the Open Category. (Photo: Mark Morelli)

The 1991 American Tour de Sol
Racing for the Sun

by **Laura Ellen Blake**
UConn English Department Intern

AS FRUSTRATION MOUNTS over energy policies that emphasize oil and nuclear energy and fail to promote conservation and energy efficiency, proponents of alternate energy sources continue to encourage us all to examine the options. Among these is the sun. That glorious morning star that brightens our day also offers us some alternatives to fossil fuel.

Without government support, however, any widespread decision to use solar energy depends on individual choices. We all have these choices to consider, and we should have the common sense to use that which places the least amount of strain on our non-renewable resources.

Those who promote, organize, and participate in the American Tour de Sol had the world's needs in mind when they got together to organize the race. NESEA (Northeast Sustainable Energy Association) has organized the American Tour de Sol since the race first began in 1989. NESEA, in conjunction with the race's other major sponsors (New Hampshire's Governor's Energy Office, the U.S. Department of Energy, New England Electric System, and the Nathan Cummings Foundation), supports the aims of the American Tour de Sol.

These aims are to promote the uses and benefits of solar and electric vehicles, to provide a vision of future transportation, and to provide challenging environmental projects for high school and college students interested in engineering.

The Tour de Sol began three years ago with only five entrants and a handful of spectators. The race was modeled after the Swiss Tour de Sol, although some rules and regulations were changed to adapt to United States road

regulations.

The race is broken down into categories which correspond to different automotive and transportation needs. The commuter category must boast a practical solar or electric car able to travel at normal road speeds for about 50 miles per day. The racing category is for automobiles which can efficiently race at 65 miles per hour and have a driving range of over 100 miles per day. A cross-continental category includes cars which can travel long distances at lower traveling speeds. There is also an innovative storage category for those interested in producing an automobile which utilizes hydrogen fuel cells and other forms of energy conversion and storage. Lastly, there is an open category for those who want to enter a car which fulfills the aims of the race but does not fit into any particular category. In the 1991 American Tour de Sol there will be between 25 and 50 entrants, most of which fall into the racing, cross continental, and commuter categories.

These categories allow for some flexibility within the race, yet still serve to promote the development of non-polluting solar and electric vehicles for everyday use. These vehicles should be usable in inclement weather and for nighttime driving, which increases their feasibility as commuter cars.

Electric vehicles emit almost no pollutant gases -- carbon monoxide, hydrocarbons, or nitrogen oxides -- into the atmosphere, although small amounts of pollution are generated by backup gasoline engines in "hybrid" vehicles or by cars' gas heaters.

The need for charging an electric car's batteries with power generated by a utility company is reduced by the development of solar-electric automobiles. These cars use solar energy to recharge their batteries.

The process of converting solar rays into electricity is called photovoltaics. Photovoltaic cells are durable and entirely free of moving parts which could break down over time, which helps keep operating costs low.

On the average, battery operated electric automobiles cost between five and eight cents per mile to operate. This figure includes complete automobile maintenance and compares well with today's standard gasoline powered vehicle, for which fuel alone may cost six cents per mile.

Because of the purchase price for the equipment for photovoltaic-generated energy, overall cost for a solar car is still fairly expensive, ranging from 20 to 30 cents per kilowatt hour, although these numbers have dropped sharply from $60 per kilowatt hour in 1970. And prices are continuing to come down.

A photovoltaic panel can either be placed directly on the automobile or on the roof of the garage. If it is placed directly on the car, on a sunny day the car can collect enough energy to increase its mileage an extra 20 miles above the battery capacity of 50 to 100 miles per day. This mileage far exceeds the average commuter's needs and is virtually harmless to our environment. Electric and solar automobiles are expected to burst into the American car market within the next five years, and with an estimated 40 years left in our oil supply, these cars should be a welcome arrival.

Besides their environmental benefits, electric cars now boast excellent on-road performance. They are capable of both normal travelling speeds and higher speed highway travel. An electric automobile's battery range is between 50 and 100 miles per day. This mileage may appear low, but these distances would suit the needs of the average commuter.

THE PUBLIC WILL HAVE the opportunity to view the vehicles at 12 different stops the automobiles will make during the course of the 3rd Annual American Tour de Sol. Spectators are encouraged and welcome. For more information, contact Nancy Hazard at NESEA (413 774-6051). The tour itinerary is as follows:

Tour Schedule

Saturday and Sunday, May 18 and 19
Automobiles' arrival in Albany and registration. Pre-race technical testing. Spectators are welcome to view the cars from 9 a.m. to 5 p.m. at the Empire State Plaza in Albany.

Monday, May 20
American Tour de Sol begins at 1 p.m. First leg from Albany, New York, to Great Barrington. Massachusetts. Automobiles can be seen from 2:30 to 5 p.m. at Monument Mountain High School in Great Barrington.

Tuesday, May 21
Second leg from Great Barrington to Winsted and Avon, Connecticut. Spectators may view the automobiles at Winsted Regional High School from 11 a.m. to 1:30 p.m. and at the Avon Old Farms Hotel in Avon from 4 to 6:30 p.m.

Wednesday, May 22
Third leg from Avon to Hartford to Storrs. Spectators welcome at Bushnell Park, Hartford from 10 a.m. to 1 p.m. and at E.O. Smith High School in Storrs from 2 to 5:30 p.m.

Thursday, May 23
Fourth leg from Storrs to Putnam, CT, to Warwick and Providence, Rhode Island. Spectators welcome at Rotary Park in Putnam from 10 a.m. to 12:30 p.m. and at New England Institute of Technology in Warwick from 2 to 8 p.m.

Friday, May 24
Fifth leg from Providence to Plymouth, Massachusetts. Spectators welcome from 9 a.m. to 12:45 p.m. at the State House in Providence, and at Plymouth Rock, Plymouth, Massachusetts, from 2 to 5 p.m.

Saturday and Sunday, May 25 and 26
Tour de Sol Earthfair, Plymouth Rock, Plymouth, Massachusetts. Spectators welcome from 9 a.m. to 6 p.m. on Saturday and from noon to 6 p.m. on Sunday. ■

Towns Compost Leaves

by **Eric Taubenheim**
Student Intern, Trinity College

Composting site in Bristol (Photo: Kathy Alexander)

LEAF RECYCLING IS ONE OF THE requirements for Connecticut's municipalities under the state's mandatory recycling laws which call for recycling of nine designated materials as of January 1, 1991. The state is helping towns implement this program by establishing leaf composting facilities using a simple registration process with the Waste Management Bureau of the Connecticut Department of Environmental Protection.

Solid waste and water discharge permits are not required for municipalities setting up leaf composting sites; however they must be registered. During the registration process, the state provides detailed information and guidance to the municipality on current standards and regulations to be followed in setting up and maintaining a composting facility.

The most popular method of large scale leaf composting is the "windrow and turn" method. This method uses "windrows," or linear piles of leaves, lined up in rows at the composting site. The leaves are turned and tossed for aeration, usually with a front-end bucket loader. The process requires about one year for completion.

The cost of setting up and running a leaf composting facility varies greatly for each municipality. The expense of leaf collection makes up the bulk of the total cost. Stafford, for example, offers leaf collection in its denser borough only, in order to minimize this cost. Other towns, like Stamford and Bristol, offer city-wide leaf collection. Additional expenses in implementing a composting program include property costs, trucking, equipment, maintenance, and labor.

Large-scale composting in Connecticut is limited at this point to leaf composting and sewage sludge composting, although other yard and household wastes can be composted in back yard composting units. Leaf collection policies and other municipal ordinances vary greatly, causing services and procedures to vary widely from town to town.

Connecticut's leaf composting program is going very well. Many municipalities, like Stamford, Trumbull, Madison, and Manchester, already have composting facilities which are running very effectively. Windsor Locks, for another example, has contracted with Earthgro, Inc., of Lebanon, a privately owned composting company, which will "turn" their leaves with its state of the art SCAT machine.

Kathy Alexander, DEP Waste Management Bureau's Recycling Program Compost Specialist, says, "We have made great progress in the past two years. As of November 1990, 44 leaf composting sites had been registered in Connecticut, with eight additional towns using regional composting facilities. Over one half of Connecticut's three million residents are now being served by these programs."

The benefits of leaf composting are numerous. It greatly reduces the use of landfill space, and it is a neat and efficient method of recycling organic waste. The end product, compost, can be used as a soil enhancer and mulch by municipalities, landscapers, farmers and nurserymen and home gardeners. It can also be used in road maintenance and erosion control projects and to enhance final landfill cover. As Connecticut's composting program continues to progress, these benefits will not only be available to more of Connecticut's residents but the effort will also protect the delicate environment in which we live. □

Turn Over An Old Leaf!

How To Compost

prepared by the staff of
Westmoor Park

Why Compost?

The benefits of composting or "backyard recycling" of leaves, garden and yard wastes, kitchen wastes, and soil -- materials which are usually put at curbside for towns to take away -- include:

1. Saving town tax dollars spent on hauling away and disposing of these organic wastes.
2. Saving limited landfill space.
3. Providing a means of enriching garden soils.
4. Doing what nature would do if these materials were not collected.

What Is Composting?

All of the organic waste materials mentioned, if mixed together in a pile or bin, will break down, by the action of all the micro-organisms already in the soil, into a peaty-like material which is about the best soil enricher available. Ask someone who already does composting. Many call this end-product "BLACK GOLD."

Value of Compost

When compost is added to the soil, it provides a conditioning effect which chemical fertilizers cannot do. Besides increasing the soil's tilth, aeration, and water-holding capacity, compost makes nutrients already in the soil more available to plants.

This article was excerpted from a brochure prepared for West Hartford's Recycling Program. Westmoor Park is a facility of the Town of West Hartford's Department of Leisure Services.

Isn't This A Smelly Process?

No! It does not have to be, if the right materials are used correctly and unsuitable materials, which produce odors, are not used.

How To Compost

You can compost in your back yard by saving yard debris (leaves, grass clippings, and soft prunings, etc.), garden refuse, and certain kitchen items, preparing them properly, then layering these materials in a bin. It is easy if the following steps are followed.

STEP 1. Select and Prepare Site

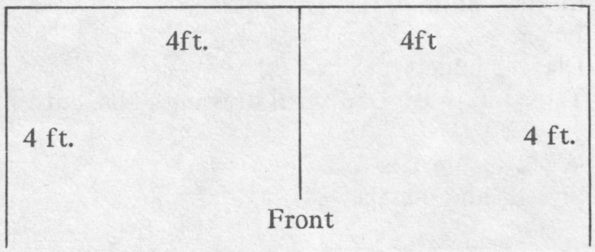
The first choice placement for a bin(s) would be in half-sun and half-shade. If such an exposure is not available, almost any exposure will do. The need to water bin contents may increase in full sun and decrease in more shade. The aim is to keep bin contents only as wet as a wrung-out sponge.

Good water drainage should be provided so water does not stand in bin or around it. Odors can develop from too much water.

STEP 2. Select Type, Size and Number of Bins

Many different enclosures are possible, including:

1. No enclosure at all, where materials should be kept in a pile. This method can make use of an out-of-the-way place for those who do not have enough material to fill a bin.
2. The most convenient set-up for the more serious composters is provided by having two bins, side by side. While one bin is being emptied of finished compost, the second bin is being filled with the current season's yard waste and garden refuse.



Bins with three sides closed, using metal fence posts and four foot high vinyl-clad wire fencing are ideal because these materials last for years. *Minimum* dimensions of four feet by four feet are recommended. Fronts of bins may be left open or extra fencing can be rolled back at

outside corners while bins are being worked -- then closed during the off-season. For composters who want or need more space, the four-foot depth shoud be kept for easy access but bins can be longer.

The configuration shown can also be constructed of wood or concrete blocks. The choice lies with the composter. If using concrete, position openings on the horizontal to allow air into the enclosure. Inside dimensions should be kept to the minimum recommended or larger.

Bins made of wood or chicken wire and wood stakes are not as long-lasting; however, this too, is the choice of the composter.

Any type of bin can be camouflaged with vines, shrubs or hedges provided bins are placed where these plants will grow.

Many self-contained commercial composting units are available. If using one of these units, please follow their directions.

STEP 3. Compost the Right Materials

Do Compost

- Leaves
- Garden refuse -- vegetable and flower
- Grass clippings
- Soil/Sod -- from edging garden beds, borders, plots, sidewalks and paths, digging new growing areas, etc.
- Manures -- Fresh horse, sheep, poultry, and rabbit
- Spring/fall yard cleanup materials
- Weeds/grass -- pull before bloom/seed set
- Hay/old winter mulch
- Soft prunnings -- twigs and leaves
- Sawdust
- Evergreen needles -- best left in place to conserve moisture under trees
- Kitchen materials -- all fruit and vegetable parings, rinds and peelings
- Coffee grounds

Do Not Compost

- Meats -- animal, fish and poultry
- Bones
- Diary products
- Table scraps covered with dressings, oils, butter and gravies
- Woody materials
- Plastics and metals

There are good reasons why these materials should not be used. Meats, bones, dairy products, and table scraps will make any composting project attractive to insects and animals, including pets. These materials will putrefy causing obnoxious odors.

Woody materials compost very slowly or not at all. Even wood chips are best aged and used as mulch material.

STEP 4. Preparing Materials

Leaves

Leaves can make up the bulk of composting materials. They can be used as gathered or coarsely shredded with a lawn mower. Unshredded leaves, if not mixed with some other materials, will mat down and slow up the decomposition. Grass clippings, old compost and soil, plus other materials, can and should be mixed into each layer added. If leaves are dry, dampen them after adding to the bin.

Any excess leaf supply can be stock-piled over the winter for use in composting during the next year's growing season until the trees shed a new supply. Shredded leaves also make a superior mulch on gardens.

Grass Clippings

DEP's Recycling Unit recommends leaving grass clippings on the lawn when possible. Grass clippings can also be an important part of any composting project (IF THEY ARE HANDLED PROPERLY). The clippings should be spread over the entire surface of the bin immediately after being collected, to a depth of no more than a six inchs to dry out. If they are put into a pile all in one place or bagged, decomposition will be so rapid that a serious odor problem can result and remain until the bin is opened up months later. Grass clippings provide a source of nitrogen that helps other materials to decompose. They also provide an excellent mulch in flower and vegetable gardens. (DO NOT USE GRASS CLIPPINGS WHICH HAVE BEEN TREATED WITH WEED KILLERS.)

Soil

Some people call soil -- one of our most precious natural resources -- "dirt," and also treat this resource with the lack of respect that name implies. It takes thousands of years and more for Nature to make that "dirt," yet tons are discarded by backyard gardeners as waste each season. Because soil is not a renewable resource in our lifetimes, conservation should begin at home. Compost enriches soil, but in order to make compost, some of that soil should be used along with garden wastes and leaves, etc.

Soil is full of micro-organisms which do the actual work of breaking down composting materials. Soil which goes off the homesite as waste cannot be retrieved. The more compost added to the soil, the richer that soil becomes and the better the growing conditions it produces.

If you do not have enough soil to spare for adding one inch to each layer when filling your compost bin, don't despair; soil clinging to garden and yard refuse may be sufficient to begin with. Once compost is made and used, the improvements in growing conditions may make it easier to spare some soil for composting.

Sod

Sod clods removed from digging new growing areas should be chopped up before being tossed into your bin.

Manures

Fresh animal manures are not readily available for use in backyard composting. Commercially available bagged manures, whether listed as "dried" or "composted" can not serve the same purpose as fresh manure in stimulating bacterial action in the composting process. Commercially bagged manures are better used directly in the garden.

To Shred or Not To Shred

Since few people begin composting with the use of a power shredder, these instructions are aimed at composting with plant material as gathered. Using completely shredded materials reduces composting time considerably and requires some adjustments to instructions found here.

STEP 5. Filling/Tending a Compost Bin

A layer of coarse, slow to compost material in the bottom of the bin will aid in draining excess water and help with air circulation.

Use as much of a mix of plant material as is possible in each layer in bin.

Compost starters are not usually needed if, on each five to 10 inch layer of materials, some soil and/or old compost is added.

Materials added to the bin should be spread over the bin surface, not piled all in one place.

For the sake of aesthetics, kitchen wastes can be hidden under material in bin.

Do not pack down material as it is added to the bin. Air is needed for decomposition. Bin contents will sink on its own after the heat of decomposition takes place.

Seldom will a composter have enough materials to fill a bin all at once. Bins are usually filled gradually as the gardening/yard chores are done. The exception may be in the fall when a new leaf supply becomes available.

Ground dolomite limestone and chemical fertilizers are seldom required if a good mix of materials is used in composting. We are told by authoritative sources that limestone does not aid decomposition. At Westmoor Park, limestone and fertilizers are added to the growing areas when soil tests indicate the need.

Water and Composting

Do not over water your compost bin. The aim is to keep bin contents only as wet as a wrung-out sponge. Sprinkling dry materials as they are added and keeping the top of contents level with a slight depression in the center will catch rainwater and winter snow. No additional water may need to be added during a normal growing season. Our normal 40+ inches of rainfall per year is usually sufficient except during a prolonged drought.

Earthworms - Can They Help

Yes, they can! Be happy if earthworms have found your compost bin. Raw organic materials such as grass, leaves and weeds are their natural food. Earthworms are nature's best soil enrichers because they eat and digest quantities of plant material and soil. After a compost bin's contents have cooled down, earthworms can move in and do a superb job of mixing the compost.

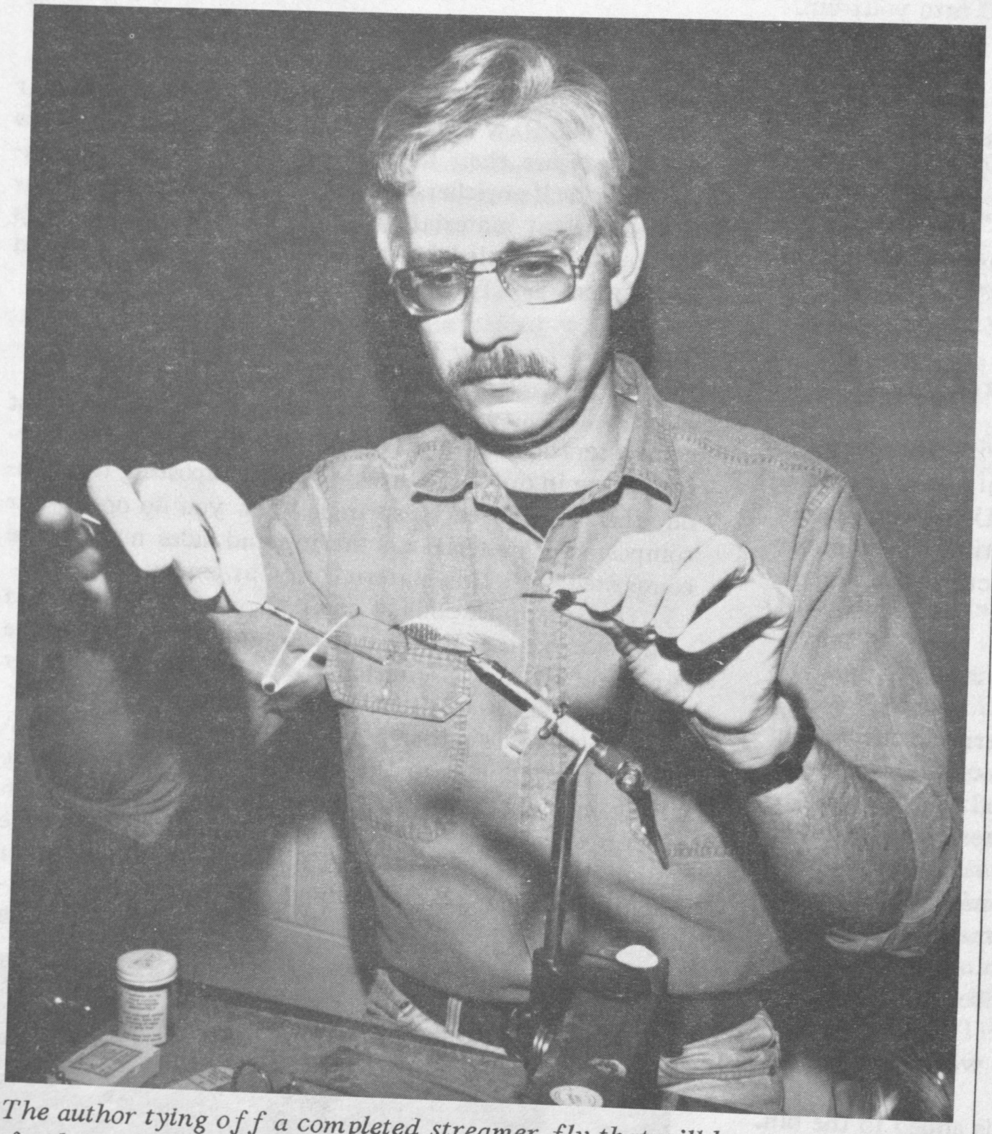
How Do I Use Compost?

Don't be in a a rush to use the compost in your bin. Most composters do not want to open their bin until the following spring in order to allow further composting throughout the fall and early spring. When you do open your compost bin, material on the top and sides may not be composted. Toss this material in your empty bin.

Yearly applications of compost or partially finished compost can either be dug into the garden or spread on the surface of the soil as a mulch. If dug into the soil, a layer can also be added to the surface as mulch.

On vegetable garden plots, a substantial layer of compost can be applied to the garden in the spring before tilling in preparation for planting. On perennial garden plantings, a yearly application of compost as a surface mulch is very beneficial as is digging plenty of compost into the soil when plants are dug for dividing and replanting. ■

Robert McNeal, a Connecticut Cooperative Extension Service Master Composter, shows a two-bin composting system at work. Your local Cooperative Extension office is a good source of information on composting. (Robert Schneiders photo)



The author tying off a completed streamer fly that will be used to imitate a fresh-water minnow. The tool on the left is a whip finisher which mechanically ties off the thread so it doesn't unravel after you cut it.

What Trout Think About . . .
Angling Entomology

Text and illustrations
by **Ray Pupedis,**
Collections Manager,
Entomology Division
Peabody Museum of Natural History
Yale University

WITH ALL THE ESTOERIC entomological data that has been dumped on the trout angler, it's common to find the beginning fly fisherman, or even the old timer, in a state of confusion and despair. For them the basics of stream entomology are often lost or obscured in a welter of Latin names and minute detail that actually amounts to nothing more than window dressing and foofaraw.

This article is a bare-bones primer of what insect groups you will normally encounter on the stream, their life cycles, and at what stages in their cycles the insect is available as trout food. This information represents the minimum amount of entomology you need to know to become a little more consistent in catching trout on a fly.

There are four primary insect groups, called orders, that are of interest to the fly fisherman: the mayflies (*Ephemeroptera*), the caddisflies (*Trichoptera*), the stoneflies (*Plecoptera*), and the true flies or midges (*Diptera*). Minor insect orders include the dragonflies and the damselflies (*Odonata*), hellgrammites (*Megaloptera*), beetles (*Coleoptera*), true bugs (*Hemiptera*), and the terrestrial or land insects that happen to fall into the water. Some of the minor groups are of infrequent value to the angler.

The first thing to do is to learn to recognize individuals that belong to the mayflies, caddisflies, stoneflies, and midges. I will not discuss identification here; there are a number of books and pamphlets written for the fly fisherman that can help you with this phase. When I say to identify the insect, I simply mean learn to recognize whether the insect is a mayfly, caddisfly, stonefly, midge or "none of the above."

Raymond Pupedis is an entomologist and an enthusiastic fly fisherman who ties his own flies. This article is reprinted, with permission, from "Heading Out Magazine" (*Vol. 6, No.4; May 1986*)

Don't try to identify the families, genera and especially the species found within each order. At this point in your entomological education, it is not necessary to be that accurate and actually represents a waste of fishing time if you try to do it on the stream. Later, when you have nothing better to do, you can learn to identify some of the insects more specifically, but frankly, that ability will impress other fishermen much more than it will impress the trout who could care less what you call the insect.

The second, and easier, task is to be able to distinguish between immature and adult insects. The difference is simply that the immatures, or young insects, do not have wings or at least not fully developed and functional ones, and they live under the water. Adults have wings and are found on top of or above the water. This recognition will determine whether you will be fishing your flies on the surface of the water or beneath it.

The third item you should be very familiar with are the basic life cycles of each group. This is just as important as recognizing the insect. This knowledge enables you to select a fly of the proper form and fish it in the right place and at the appropriate time. This is not complicated either; there are only two basic life cycles to worry about.

Mayflies and stoneflies are examples of the first type (Figure 1.) Both live as nymphs on the stream bottom. When it comes time for the nymphs to transform themselves into adults, they will move to the surface of the water, and there the adult will emerge from the nymphal skin.

The second type of life cycle is exhibited by the caddisflies and midges (Figure 2.) In these two orders, the immatures are known as larvae; these are the equivalent of the nymph stage in mayflies and stoneflies. The difference is that before these larvae can become adults, they have to pass into a pupal stage. This simply represents a period during which the larvae change into a more adult-like form, the pupa. It is this pupa that then moves to the surface to the water where it can change into an adult.

So in terms of morphological form, mayflies and stoneflies have two life stages; the nymph and adult. The caddisflies and midges have three: the larva, pupa, and adult. Now let's look at each order and see what stages are important to the fly fisherman.

Mayflies and Stoneflies

MAYFLIES ARE VULNERABLE at four periods during their life cycle: as nymphs, emergers, duns and spinners. During their nymphal stage, mayflies can be picked off submerged vegetation or the bottom by feeding trout. Nymphs are especially susceptable to being eaten when they must swim slowly or drift to the surface where they "hatch" into adults.

During the bottom dwelling period, and when migrating, standard nymph patterns are used to imitate the natural. Upon reaching the surface, the nymph breaks through with the upper portion of its body. This exposed part then subsequently splits apart, and the adult emerges through the opening in the nymphal skin. At this time, fishermen refer to the nymph as an emerger. "Hatching" usually takes some time to accomplish, and quite often the mayfly drifts helplessly downstream for a period of time. It is then that trout may start to feed actively near the surface on these insects. Emerger patterns, which are fished flush in the surface film, are extremely effective at this time. Actually, trout may take this pattern much more often than they will an imitation of the fully emerged adult.

When the adult, or dun, is free of

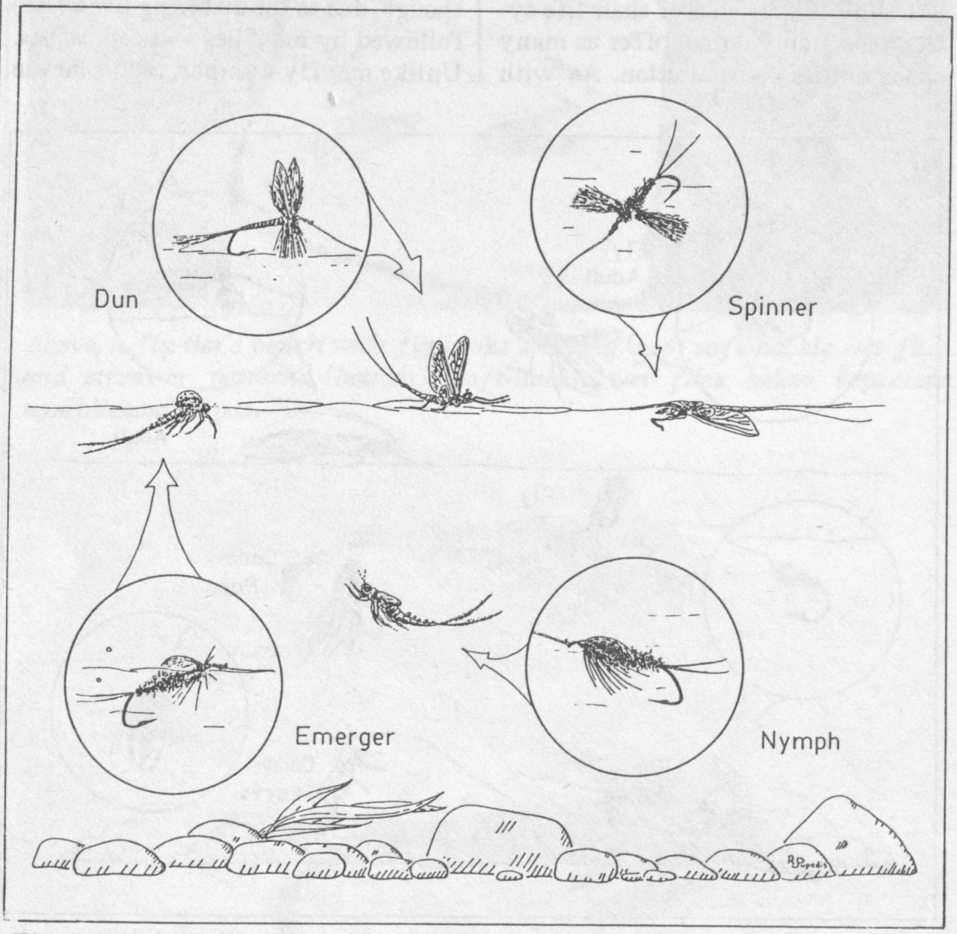


Figure 1. The four stages in the life cycle of a mayfly and the artificial flies used for each.

the nymphal skin, it will sit upon the water and dry its wings off before flying away. Once again, while drifting down the current, the adult will be taken by the waiting trout. There are a number of different artificial patterns that are used to imitate this stage: their common feature is that all are tied with upright wings.

When the adult is airborne, it will move to the streamside where it will shed its skin once more and become what is called a spinner. It is only after this change that the sexual organs of mayflies become functional. After mating, the female returns to the stream to lay her eggs. The spinner state is available as trout food during this egg laying period and when the spinners finally die and fall to the water. Fly patterns are now fished flat in the surface film with wings outstretched.

STONEFLIES, because of their life cycles, regrettably do not offer as many opportunities for imitation. As with mayflies, the stonefly nymph is available as food for the trout, and patterns representing them can be effective at times. However, the process of becoming an adult for a stonefly does not usually expose the nymph or adult to the trout. When emerging, the nymphs of nearly all species will crawl out of the water onto stones or bushes and then, while out of reach of the trout, will proceed to hatch into adults. Trout may obtain the adult as food if the stonefly accidentally falls into the water or when the female stonefly returns to lay her eggs. A downwing fly can be used to imitate the adult.

Caddisflies and Midges

DEPENDING ON THE STREAM, caddisflies may often beat out mayflies in terms of importance as trout food. The stages eaten by the trout are different though, due to the differing life cycles followed by mayflies and caddisflies. Unlike mayfly nymphs, caddis larvae are seldom available as food. This is because the larvae of most caddisflies build cases or shelters that hide them from the trout. There are a few that do not build cases or may roam freely about with the case, and trout may feed upon these larvae, case and all usually. Yet generally the use of larvae caddis imitations offer inconsistent success for the fly fisherman.

It is during the process of becoming adult that caddisflies really come to the attention of trout. As mentioned before, larvae must transform themselves into pupae before they can become adults. Pupation for the caddis occurs within the protection of its case or a newly constructed shelter. It is only when the pupa breaks out of the case and has to swim to the surface that it becomes potential trout food. Unlike the mayflies, for caddisflies this swim to the surface is not a leisurely affair. The pupa actively swims and tries to reach the surface without wasting any time; and once there the pupa rapidly transforms itself into an adult which, in turn, almost immediately flies off.

What this means is that the trout is going to bust a gut trying to catch the fast moving caddis pupa or adult before it disappears (and in the days before monofilament, fishermen would also be busting a gut on occasion during this hectic feeding period).

This whole affair is definitely not like the slower-paced mayfly fishing where the trout waits for the mayfly to drift down to him. Pupal patterns that swim through the water and downwing flies fished on the surface are the primary patterns that promise success. These same dry downwing patterns are used when the females come back to the stream to lay their eggs.

TRUE FLIES or *Diptera* exhibit the same type of life cycle as the caddis; however, the behavior of the various life stages is different and so they do not offer the same kind of fishing. In fact, due to the small size of the insect, fishing midges is usually a try-

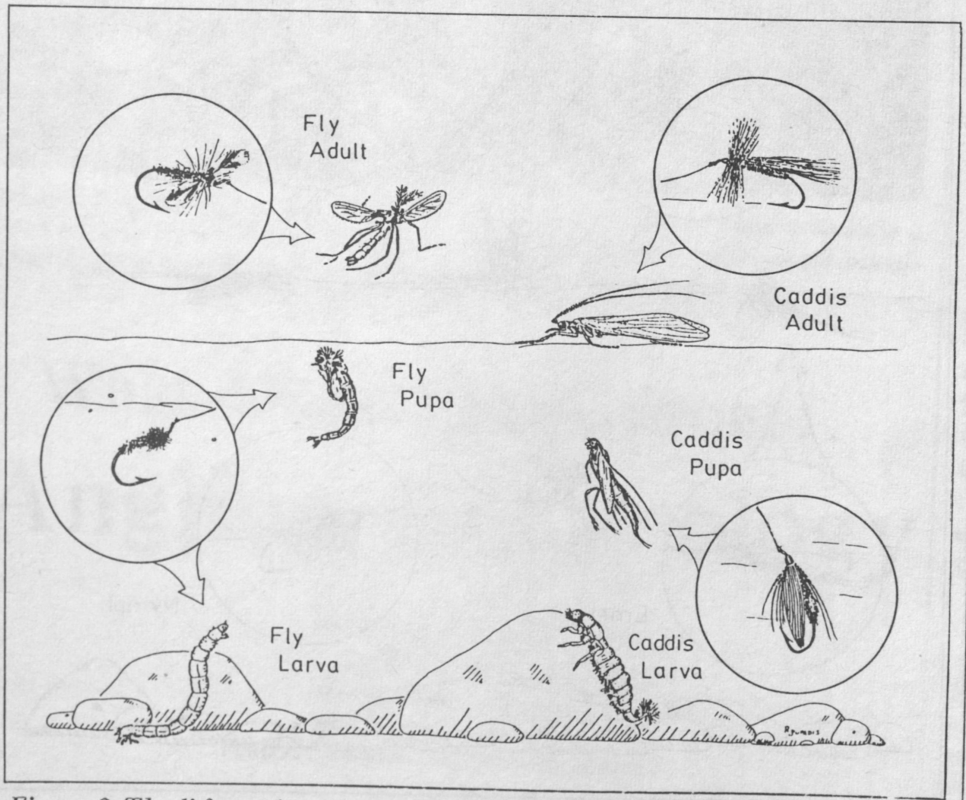


Figure 2. The life cycles of the true flies (left), caddisflies (right), and the artificial flies that imitate each.

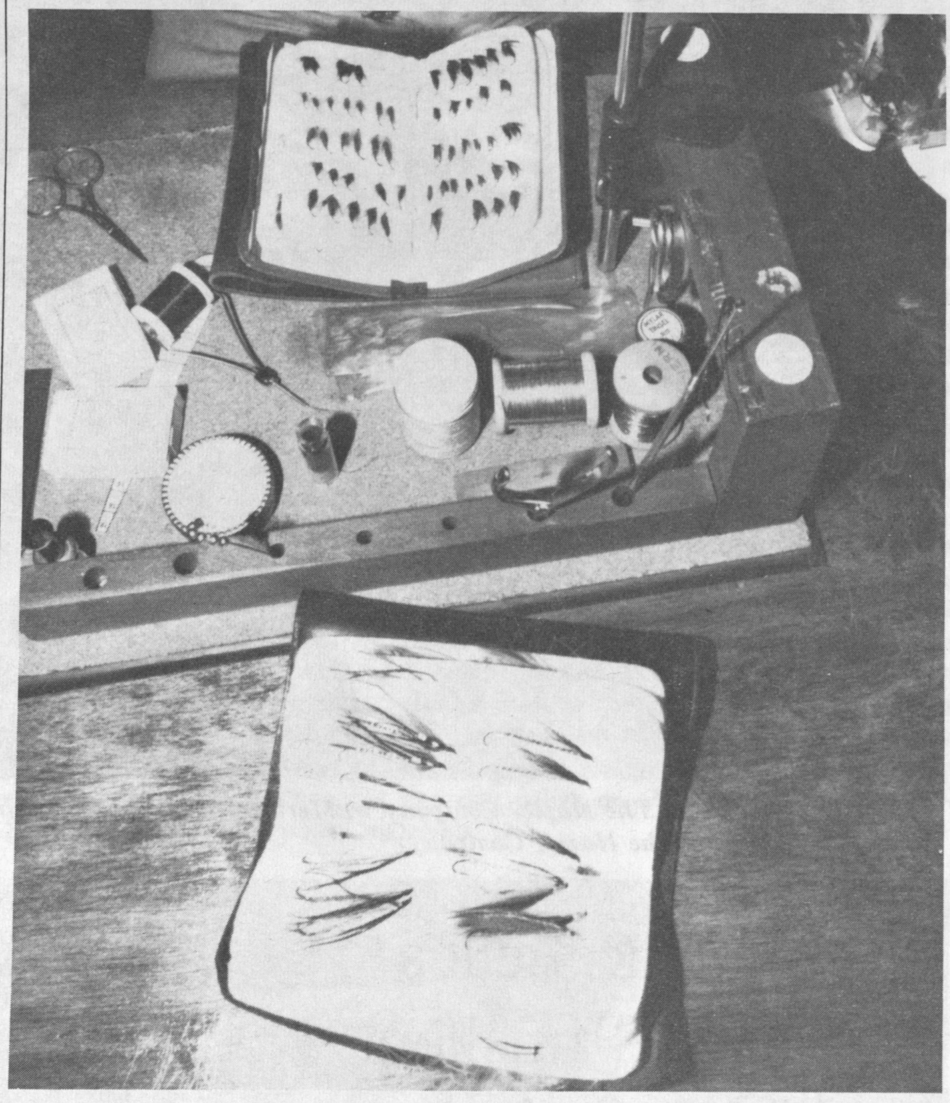
ng experience, though often very successful. I'm going to confine my remarks to craneflies and midges; these are probably the ones you will most often encounter on the stream.

Larvae of both groups are bottom dwellers, some in cases, others in muck or wood. While midge larvae may be important as trout food, cranefly larvae and pupae are seldom consistently available to the trout. The adult cranefly may be taken on occasion when the female returns to lay her eggs. This last stage is the only one for which a few patterns have been consistently tried.

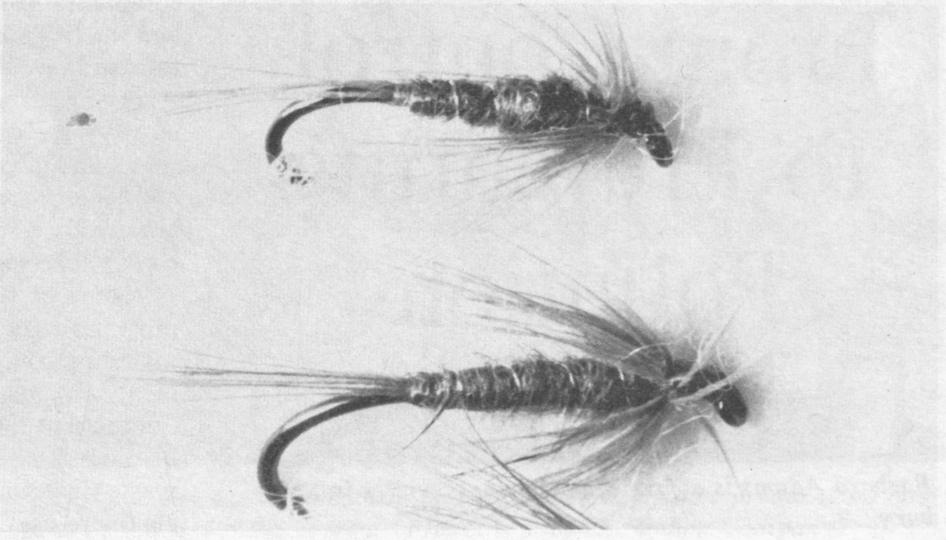
Midge larvae and pupae may be found floating free or swimming about. This is also true of mosquito larvae. Trout readily feed upon both stages. That is when small and sparsely dressed patterns are fished drifting motionless just below the surface of the water. Adult midges, which can found swarming over the surface or near the banks, are imitated with small patterns fished nearly flush in the surface film.

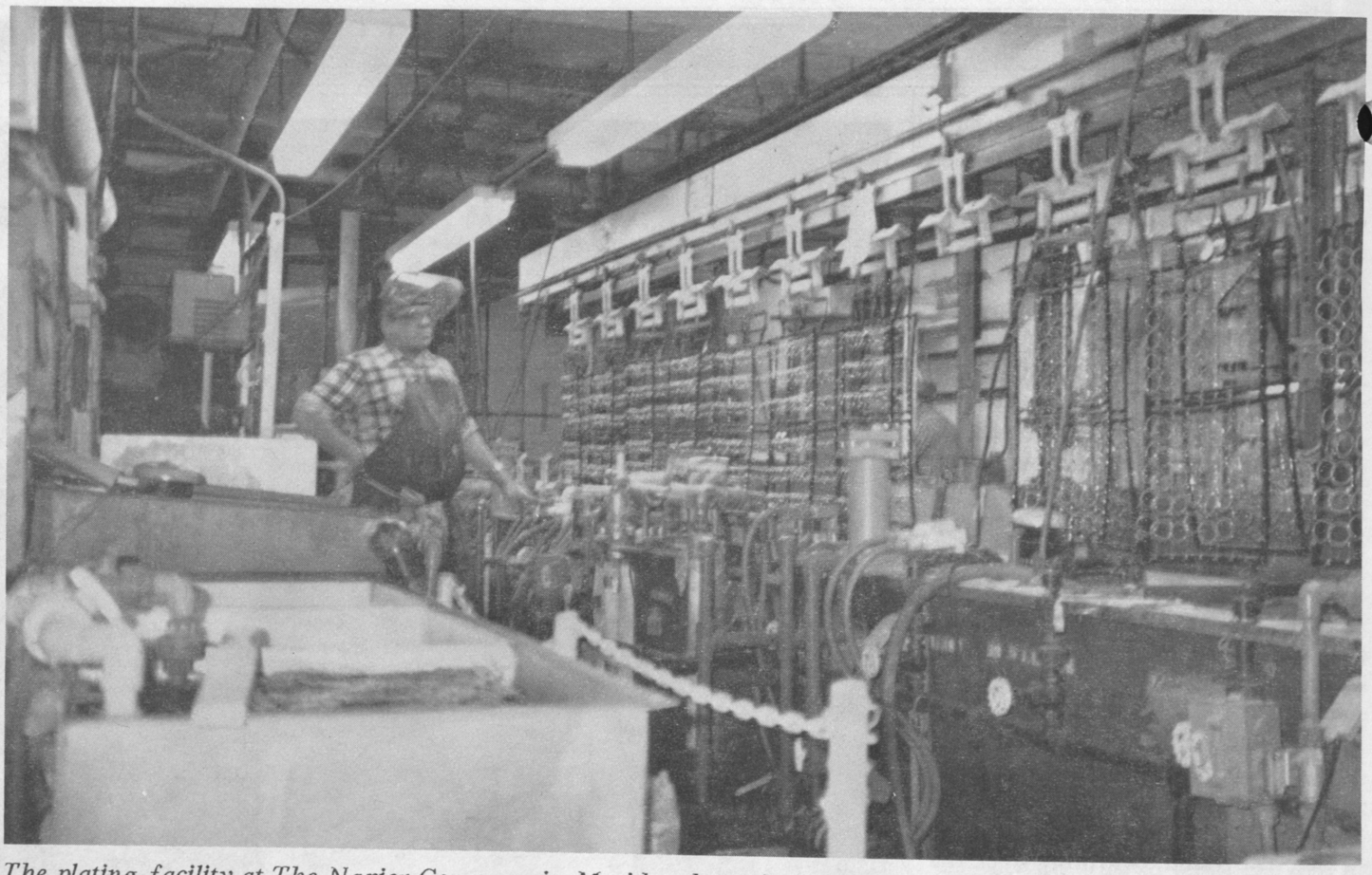
As a quick aside, I will mention that dragonflies and damselflies pass through nymphal and adult stages; with the exception of imitating adults for bass fishing, only the nymph is of occasional interest to the fly fisherman. *Megaloptera*, the hellgrammites and fishflies, exist as larvae, pupae and adults. Only the larvae are available as food; large weighted imitations of the larvae often prove to be effective in fooling the fish.

To all of the above, you will find exceptions and complications. But so long as you keep in mind the basic life cycles outlined and why only certain stages are of importance, you should have no difficulty in adjusting to new insects or fishing situations. With this basic knowledge, the fly fisherman can recognize what type of insect the trout is feeding on, and then, by knowing the life cycle of that particular insect and the life stages it passes through, he or she can more readily determine what stage to represent with an artificial fly. ■



Above, a fly-tier's bench with fly books showing (top) soft-hackle wet flies and streamer patterns (bottom). Soft-hackle wet flies, below, represent nymphs and pupae.





The plating facility at The Napier Company, in Meriden, has adopted "point source recovery loops" on its several plating lines. (Photo: The Napier Company)

Connecticut's Metal Finishers Make the Switch

From Control To Preventing Pollution

By Barbara Adams

Barbara Adams is a free lance business writer in Simsbury.

THE INCENTIVES ARE EXTERNAL -- the difficulty and high costs of complying with state and federal regulations, long-term liability, and business pressures -- as well as internal -- the environmental consciences of many people who run metal finishing operations. The result is a growing belief among Connecticut's metal finishers that it is better to prevent pollution than to control it at the end of the pipe.

This philosophy coincides with the direction in which Environmental Protection Agency (EPA) regional administrator Julie Belaga wants to guide local industries, and the DEP and other statewide organizations have also assisted individual companies trying to achieve this goal. Applying currently available technology to a wide range of manufacturing methods, a number of Connecticut companies have made process changes to minimize waste and conserve resources significantly. And these measures are already effecting substantial cost savings which make good business sense.

Some of the most basic changes in manufacturing processes include the use of methods to reduce water flow, including conductivity meters, spray rinses, and equipment to reduce evaporation. However, more progressive Connecticut metal finishers have gone beyond these basic methods to employ closed loop technology for recycling waste rinse water to the plating bath and recovering metals for re-use.

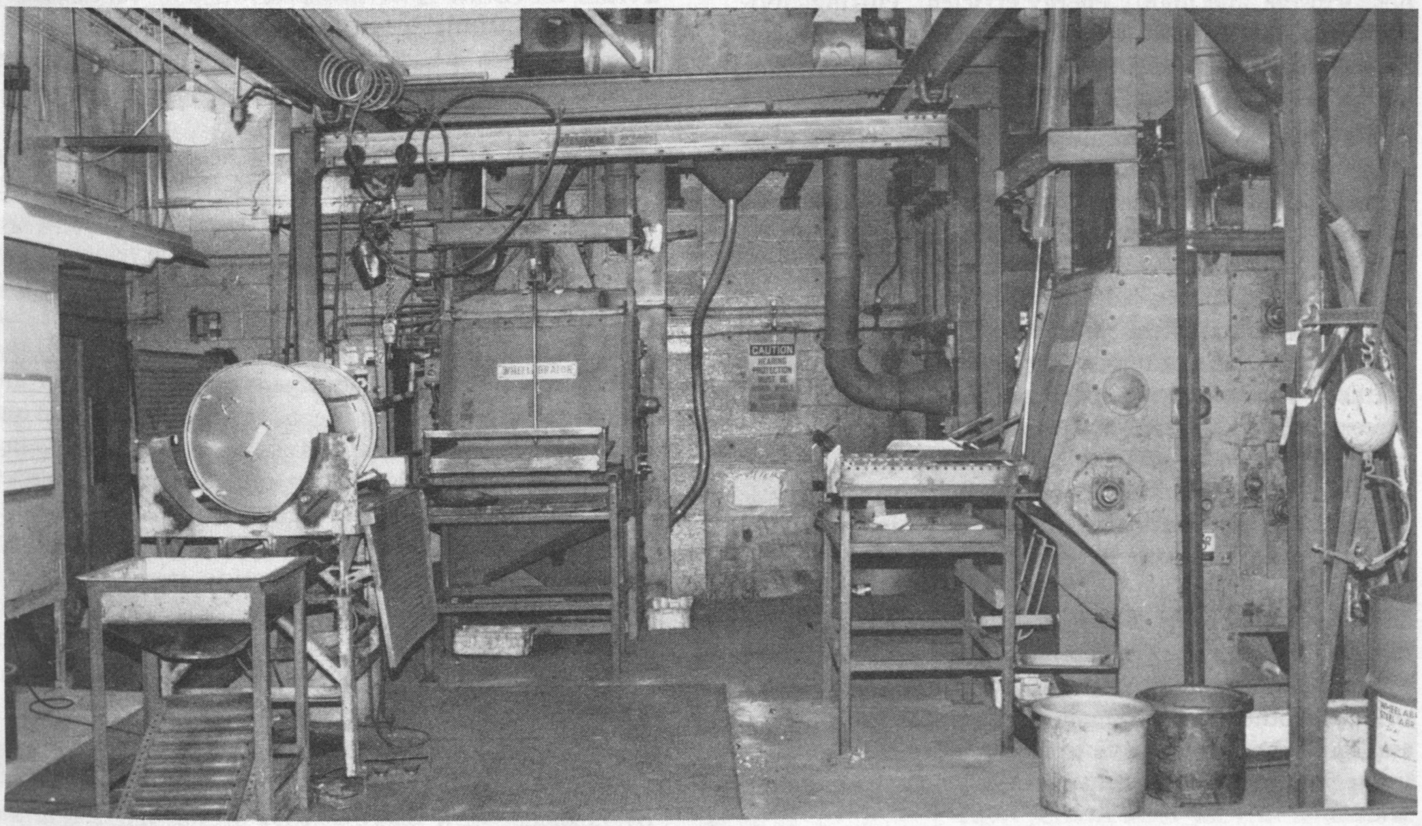
For instance, the new owners of Automatic Plating of Bridgeport have implemented a procedure for recycling rinses in plating operations involving cyanide, reducing waterflow from 70 to 50 gallons per minute and reducing the amount of toxic pollutants while increasing operational efficiency. Once the object of a DEP lawsuit, the company demonstrated its commitment to turn-around by designating its entire 1990 capital budget for pollution projects and developing a comprehensive long-term pollution prevention plan.

Using similar methods of water reduction and re-use, the 40-employee Seaboard Metal Finishing Co. of West Haven reports a 75 percent reduction of waste water containing chromium, nickel and cyanide -- measures which alone will bring an expected annual savings of $15,000.

Even the smaller electroforming company A.J. Tuck of Brookfield, which recently achieved an impressive zero discharge to the Still River through recycling and recovery methods, expects to realize material cost savings. Elimination of required monthly laboratory analysis and quarterly bio-monitoring of discharge water will save the company $13,000 over last year, and a nearly 60 percent reduction in one category of hazardous sludge will greatly lower costly disposal and hauling fees, according to the company technical director, Moe Elshazly. In addition, metal recovery allows companies to cut the cost of materials.

Perhaps the most dramatic example of an environmental reversal is The Napier Co., a 600-employee jewelry manufacturing business located in Meriden, which went from having compliance problems with the state to receiving a 1990 Environmental Achievement Award from EPA's Region I. Beginning in the mid-1980's, under new environmentally conscious management, the company did an evaluation of waste in every aspect of the business and received encouragement from the DEP to make changes. Through process modifications and engineered solutions, such as the redesigning of plating lines to incorporate evaporative recovery technology and a five-station counterflow recovery and constituent segregation system, Napier's facility has become a 99 percent closed loop. As a result, the company's total plant water usage fell from in excess of 96 million gallons in the early 1980's to 7.2 million in 1990, and during all of 1990 it achieved a zero discharge to nearby Clark Brook -- all despite a large increase in production volume. But rather than resting on the laurels of its environmental award, the company's management continues to develop alternatives to particular toxic plating materials. Already it has begun using a nontoxic alternative to freon.

Other companies have designed effective process changes suited to their particular operations. For example, Thomaston's Whyco Chromium has replaced chemical descalers for removing dirt and tarnish from steel with a mechanical cleaning process. Bridgeport's Bead Industries, manufacturer of hollow tubular pins and beads, has achieved a 60 percent reduction of its water flow by nearly eliminating a pre-plating tumbling process and by changing to a dry polish on all products made of pre-plated materials.



At Whyco Chromium Company, in Waterbury, this mechanical cleaning and descaling operation produces no hazardous waste and replaces a cyanide based chemical descaling system. (Photo: Whyco Chromium Company)

With the help of a matching grant from the Connecticut Hazardous Waste Management Service (CHWMS), Bead is studying the possibility of applying centrifuge technology to reducing the amount of lubricating oil residues prior to degreasing -- thereby minimizing the amount of hazardous waste generated. The company, which employs about 85 people, expects that implementing all of the ideas suggested by its environmental audits over the next 18 months will save in excess of $100,000 per year.

The majority of the savings will come from the recovery of metals through closed loop plating. Bead's vice president Kirby Thwing, Jr., points out another source of savings: "We are definitely working towards creating a minimum amount of pollution. Meeting regulatory requirements for controlling pollution at the end of the pipe requires a large expense and manpower that can more profitably be used in other areas. It presently requires close to half of my time and that of another full-time employee."

In addition to these and other methods for waste minimization, some companies have embarked on campaigns to reduce the use of toxic substances by employing more benign substitutes.* Using alternative finishes in plating operations has worked well for some companies. For a number of years, Seaboard Metal Finishing has successfully used an environmentally clean plated tin-cobalt alloy to replace the more hazardous chromium in finishing operations for a wide range of commercial applications. The alloy, which the company calls Seachrome, is nontoxic, noncorrosive, and highly energy efficient. Putting environmental interests over competitive advantage, Seaboard's president Carl Wheeler has begun publicizing the benefits of the alternative finish.

In 1989, Whyco Chromium patented WhyKore III, a plating system for coating nuts and screws in which the company had invested two to three years and several hundred thousand dollars developing. The three-layer plating system, composed of nickel, a specialized alloy and a black organic paint, required only half the number of coatings as the previously used multi-layer finish containing copper and cadmium, among other elements. And the new process has trimmed the operational cost by 26 percent. Whyco's president Mark Hyner comments, "The present regulatory situation, which requires us to spend most of our time and resources dealing with regulations for end-of-pipe pollution control, greatly hinders a small company like ours from investing in research and development of pollution preventing process changes. In 1990, Whyco spent 15 cents of every sales dollar on treating and hauling wastes and maintaining a staff to oversee environmental compliance. With tax incentives, more flexible rules, and other encouragements for companies to develop and implement innovative technologies to reduce wastes in the first place, we could see dramatic results industry-wide."

Could adapting to environmental realities completely transform a business? That is exactly the response that the Electronics Metal Finishing Company of Danbury found most appropriate. Recognizing the difficulty of meeting aquatic toxicity standards, even with recycling techniques, and reeling from the high costs of laboratory testing and waste treatment, EMF's management made a major business decision in 1990 to cease operating a manufacturing process and strive for zero discharge to the river.

EMF eliminated its job shop plating room for working in gold, silver, copper, and nickel. Focusing on its copper and nickel electroforming operations, the company now does only a selected quantity of nickel plating. The effluents generated by present operations eventually go to a recovery facility. Says Doug Olsen, EMF's environmental compliance manager, "We now discharge nothing to the river, and within six months we expect to send 99 percent of our waste to be recovered. By changing our business, we made what we do best and most profitably coincide with what is most environmentally sound. The environment affects business decisions in a very real way -- it has to."

For many of these small businesses, accomplishing sweeping changes in pollution prevention would not have been possible without outside financial and technical support at the federal and state levels. In addition to the technical assistance and funding provided by CHWMS, for instance, many companies benefit from the educational programs in advanced metal and wastewater recovery technologies provided by the Connecticut Association of Metal Finishers (CAMF) as well as the association's legislative and regulatory advocacy. Among its current activities, the CAMF is writing a pollution prevention guide for metal finishing operations and trying to secure funding to establish a business outreach center for pollution prevention -- a practical system of business helping business.

Speaking at a public hearing held by U.S. Senator Joseph Lieberman last April, Julie Belaga commented, "We have focused on a couple of metal finishing industries in this state that have done some marvelous thinking, rethinking and retooling ... Connecticut and the metal finishing industry is a classic case of how very doable this kind of cleanup is." The companies at the forefront of the pollution prevention movement in Connecticut are demonstrating that what is good for the environment can certainly be good for business as well. While researching and implementing changes in manufacturing processes sometimes requires difficult problem-solving, these tasks -- which involve management, employees, regulators and consultants in a positive new active partnership -- are strengthening business to become more competitive in the 1990's and beyond.

** Michael Harder, Director of the Division of Engineering and Enforcement for D.E.P.'s Water Management Bureau, offers a caution: if companies replace one type of chemical with another, they should check that the change remains consistent with any water discharge permits and request permit modifications if necessary.* ■

Birds and Biodiversity

by **Alan Levere**
Senior Environmental Analyst

EVEN THOUGH SPRING actually started in March it doesn't really seem to kick in until the weather responds. This could be any time from early April until mid-May. But with the onset of warmer weather comes the flowers and the insects and the birds: the emergence of life. Slowly, our yearly recognition of change makes us appreciate that spring means life. The investigation of that life means biology, and the study of it all is the celebration of spring. It is that celebration that this month's column deals with.

Two books that are new to us deal wonderfully with things that are alive.

The first is entitled *Birds of the Connecticut College Arboretum: Population Changes Over Forty Years.* The title might lead you to believe that this is a site specific study. In fact, it is an excellent discourse on the change in bird populations resulting from changes in vegetation. Some of the vegetation changes, and the resulting bird population changes, described at the arboretum reflect the changes that have occurred statewide over the course of the study period.

The observations took place at the 435 acre arboretum in New London. The wide range of bird species is due in part to the diversity of arboretum habitat (open field, forested upland, wetlands, inland open water, and tidal coast of the Thames River). Over the last four decades some of the open fields (former farmland) have experienced successional growth from fields and shrubs to heavy woodland. That translates to the loss of some habitat types and the gain of others. The vegetational changes have resulted in related changes in the bird communities. Over the years at least 218 bird species have been documented, both for frequency and seasons of their visits.

The book itself includes maps, charts, drawings, and photos, a summary of seasonal observations, special notes about the various study sites within the arboretum, and an annotated checklist of 218 birds with their seasonal frequency of visitation charted. 43 pages, black and white with a full color cover featuring a hooded warbler. **$4.00.**

* * * * * * * *

THE SECOND BOOK is larger in volume and more wide reaching in its geographical scope and its subject matter. It explores what we spoke about earlier: the diversity of life that makes up our springtime.

Entitled *Biodiversity*, it delves into many of the major subjects that dominate the field today. The book is divided into 13 sections that attempt to answer the questions of biodiversity: what it is, why it is important, causes and consequences of loss, how it is threatened, and strategies to maintain its current levels.

Within those bounds, some of the individual section titles -- including "Restoration of Degraded Lands in the Amazon Basin," "Why Put Value on Diversity?," "Diversity and Biological Invasions of Oceanic Islands," and "Screening Plants for New Medicines" -- attempt to answer these questions.

Realizing that what happens here at home has potential effects on the biodiversity elsewhere in this world, and realizing that the whole of the study area (the world) is a dynamic, changing system, you'll find the book's 500+ pages will help you gain a perspective on many of the issues that are shaping today's environmental discussions.

In all, 57 chapters are presented, averaging about eight pages long, all well referenced. Many graphs, charts, and color and black and white photographs; 521 pages; **$19.50.**

IN ADDITION TO THE BOOK, a video tape by the same name is available. Fifty minutes in length, the tape presents visually the concerns that the book deals with in print. The opening eight minutes set the stage for the discussion, with scenes of the world's animal and plant population diversity. Then a six-member panel discussion, which includes the editor and four contributors to the book, begins. Their dialog adds life to the questions and will open your eyes to the issues critical to the maintenance of the world's biodiversity. May be especially valuable to teachers. VHS format only. Available only with the book, the set is **$37.40.**

SPRING IS THE TIME to consider the life that enriches our planet. The opportunity is here to help increase that appreciation.

To order, please include $2.00 per order (not per item) for shipping and eight percent sales tax. Our address is: DEP-NRC, Map Sales, Room 555, 165 Capitol Avenue, Hartford, CT 06106. □

The Parsley Family

by
Gale W. Carter
Illustrations by
Caryn Furbush

(*Umbelliferae = Apiaceae*)

THE PARSLEY FAMILY is a large group that contains many familiar plants. A number of these are of considerable economic importance because of their use as food. Carrots, parsnips, and celery are common examples. Dill, caraway, and fennel are used as well known spices. Some plants such as Queen Anne's lace are used as ornamentals.

A number of species have poisonous properties. These include water and poison hemlocks and fool's parsley.

Members of this family may be either biennials or perennials and are usually herbs. They are sometimes woody but are rarely trees.

Flowers of the *Umbelliferae* can be found in the East from February to September. The earliest species to blossom is harbinger-of-spring (*Erigenia bulbosa*), sometimes called salt and pepper. This may bloom in western New York as early as February.

CHARACTERISTICS OF THE parsley family include:

- Small white or yellow flowers, usually in flat-topped clusters (umbels), rarely in heads, e.g. rattlesnake-masters (*Eryngium spp.*)
- Leaves alternate, often divided and redivided
- Leaf stalks (petioles) usually with sheaths at their base
- Five petals, often curved at the tip, and five stamens attached to a disk around the base of two styles
- Ovary with two compartments, each with a single ovule
- Sepals are small and insignificant, often dropping off early
- Stems usually hollow (between nodes), often ridged
- Fruit of two fused portions that split apart but hang from their tops by a slender stalk. Each of the two parts contains a single seed that is ridged with oil ducts between the ridges

GOLDEN ALEXANDERS (*Zizia aurea*) is one of the earliest members of the parsley family to blossom, appearing from April to June. It is a common perennial that grows from one to three feet tall. The stem is usually branched and may be stained with red.

The leaves are twice or thrice divided. There are usually three to seven lance-like or egg-shaped leaflets that are sharply toothed. Its basal and lower leaves are long-stalked. The upper leaves are short stalked.

The tiny golden yellow flowers with their easily distinguished stamens are arranged in flat-topped clusters (a compound umbel). Each cluster (secondary umbel) is loosely separated from the others. All of the clusters together are about two inches wide.

The umbels are supported by from 10 to 18 stalks, or rays, and there are no bracts.

The conspicuous feature of the fruit is its rounded ribs. Golden alexanders grow in moist areas such as meadows, wet woods, and the borders of streams.

The genus name *Zizia* was given this group of plants in honor of Johann Baptist Ziz, a German botanist (1779-1829). Its species name is Latin for "golden," referring to the color of

Golden Alexanders
(Zizia aurea)

the flower. The common name rightfully belongs to a European species that has ties with Alexandria.

Historically, golden alexanders were believed to be useful for the treatment of wounds and syphilis and for promoting sweating when it was useful in treating diseases. They also were reported to have some of the same medicinal qualities as those of fool's parsley (*Aethusa*). This would mean that golden alexanders were useful in the treatment of gastrointestinal problems and diarrhea in children.

Golden alexanders resemble the meadow parsnip (*Thaspium*) in many ways, but the ribs on the fruit, or seed, are winged rather than round as in Zizia, and in meadow parsnip all of the flowers and fruit are stalked.

SWEET CICELY (*Osmorhiza claytonia*) is a perennial with a soft hairy stem, lacking the typical flat flower cluster of many of the parsley family. It varies in height from one to three feet.

The leaves are alternate and fernlike. They are thrice divided into leaflets that are bluntly toothed on their margins. The lower leaves have long stalks while the upper ones are nearly stalkless.

The roots of sweet cicely are fleshy and clustered. They contain an anise oil which emits a licorice-like odor if bruised. The same aroma is found in the stems and leaves if they are crushed.

The small white flowers appear in umbels but are sparsely arranged on only a few slender stalks. Each floret has five incurved pointed petals that are less than 1/6th inch wide. The styles are shorter than the petals. The blossoming time is from May to June.

Sweet cicely has a fruit that is long, narrow, tapered and covered with stiff bristles along the ribs. Two styles persist on the top of the fruit.

Look for this species in moist woodlands and in damp spots along roadsides.

The genus name is a combination of two Greek words, *Osme*, "scent," and *rhiza*, "root." Its species name honors John Clayton, a famous early American botanist.

The common name comes from *sesele*, an old Greek word for some sweet smelling plant.

Early Americans used sweet cicely in many ways. The dried roots were pounded and used for poultices to be applied externally to a variety of sores and wounds. A decoction prepared from the root, stem, and leaves was used to treat kidney ailments, and a tea was made for coughs and used as a wash for irritated eyes.

The fragrant oil from the root has been used in anise flavoring.

Osmorhiza longstylis, a similar species, has a nearly smooth stem, a larger fruit, and styles that are longer than the petals. It is the stronger scented of the two species.

WATER HEMLOCK (*Cicuta maculata*) is a stout, many branched plant with a stem that is blotched or spotted with purple. The stem is hollow except where the leaves are attached. It varies in height from three to six feet.

The alternate leaves are two to three times divided and may be as long as one foot. Each leaflet is narrow, toothed, and sharply pointed at the end. Flowers of water hemlock are in flat clusters (umbels) that may be as much as four inches wide. Each white flower has five petals and five stamens. The florets are about 1/6th inch long with few or no bracts beneath. Blossoming time is from May to September. Its fruit has five thick ridges on one side and is flattened on the other.

Water hemlock is a wetland plant found near the edges of swamps, ponds, rivers, and streams.

The genus name *Cicuta* was the ancient name for poison hemlock -- now called *Conium maculatum*. The species name *maculata* means "spotted." This describes the stem that is often streaked or spotted with purple.

Water hemlock is best known for its poisonous properties. According to Kingsley's book, *Deadly Harvest*, one mouthful can kill a man. It is considered by many as the most poisonous plant in North America. The poison, cicutoxin, is chiefly found in the roots which are clustered and resemble small sweet potatoes that smell like parsnips. The death it causes is a violent one, with severe convulsions and great pain.

Poison hemlock, a closely related species, also has a spotted stem but it has leaves that are finely cut like those of Queen Anne's lace, or wild carrot. The habitat is different from water hemlock, the poison hemlock being found on drier sites. In addition, it lacks the swollen base and cross partitions in the lower stem that are present in the water hemlock.

It was the poison hemlock that was used to kill Socrates and other political prisoners in the past.

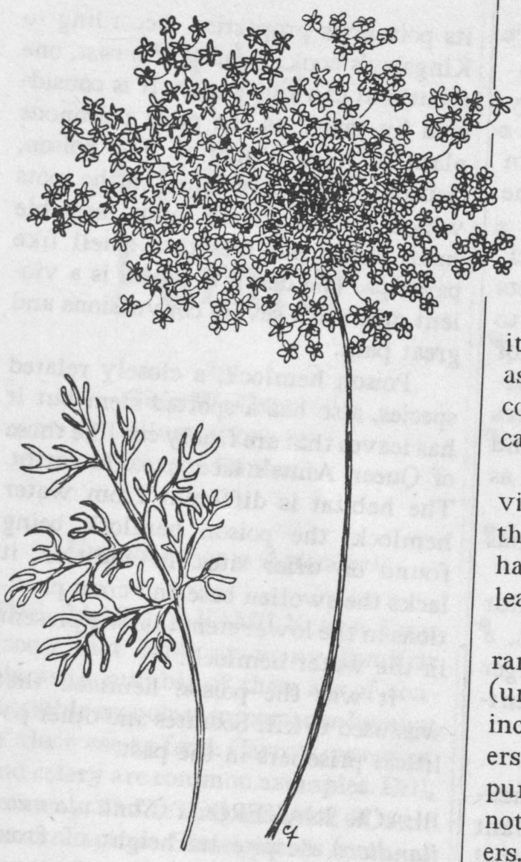
BLACK SNAKEROOT (*Sanicula marilandica*), despite its height of from one to four feet, is a plant that one might easily walk by without noticing. The flower is usually the most conspicuous feature of this plant. It is small and nondescript, being one of the more inconspicuous members of the parsley family.

The smooth, light green, hollow stem is somewhat grooved, and it has long stalked leaves that are divided into five leaflets that are sharply toothed. Two of the leaflets are usually deeply cut, giving the appearance of seven leaflets.

The tiny, greenish-white to yellowish flowers appear in small umbels supported by two to four stalks, or rays, of unequal length. Leafy bracts are present at the base of these umbels. Each floret has five incurved petals. Blossoming time for this species is from April to July.

Its fruit is a tiny, oval, stalkless burr with many hooked bristles. Two slender styles often persist on the fruit extending upward from the top.

Black snakeroot is found in dry open woods and meadows.



Queen Anne's Lace
(Daucus carota)

The generic name comes from the Latin *sanus*, meaning "healthy," a reference to its many uses in medicine. The species name *marilandica* indicates the area where this plant was first described.

The root of black snakeroot was used in many ways medicinally. Medicine concocted from this plant was considered an excellent treatment for quieting the nerves as well as being a good blood purifier.

American Indians prepared a tea that was administered for a variety of ailments that included menstrual irregularities, pain, and rheumatic fever. They also pounded the root and used it as a poultice that was used to cure rattlesnake bites as well as other snake bites, the reason for its common name.

COW PARSNIP (*Heracleum maximum*), because of its size and unpleasant odor, is a plant that is hard to forget. Some individual plants may grow to ten feet in height, while the base of its ridged hollow stem may be as much as two inches in diameter. The stem is covered with dense hairs and may occasionally have a reddish-brown stain.

Its huge dark green leaves are divided into three maple-like leaflets that are irregularly toothed. Each leaf has an inflated sheath at the base of its leafstalk.

Flowers of cow parsnip are arranged in large flat-topped clusters (umbels) that are from four to eight inches in width. The individual flowers are white or sometimes slightly purple. They are five-petaled and notched, some petals more so than others. Blossoming time is June to August.

The fruit is flat and heart-shaped, with five ribs on each side. This species is found near the edges of moist thickets and in wet meadows.

The genus name *Heracleum* honors Hercules. Cow parsnip is one of the biggest members of the parsley family, hence the species name *maximum*.

The word parsnip has evolved from several words meaning "to dig up," a reference to its roots that are edible. Not only are the roots edible but the stems and leaves are as well.

American Indians boiled the root and added it to their fishing nets as a lure. They also made a root tea that was useful for treating respiratory ailments as well as headaches and cramps. The plant was also used as an external poultice for treating rheumatism and a variety of bruises and sores. Recently, the root has been tested for possible use in the treatment of psoriasis and leukemia.

Angelica (*Angelica atropurpurea*) is a similar species that grows in a wetter environment. It has a smooth purple stem and three divided leaves that may be divided again into three or fi leaflets.

QUEEN ANNE'S LACE (*Daucus carota*) is one of the most beautiful plants of roadsides, waste areas, and fields. It is related to the common garden carrot, both having evolved from the root of a Eurasian species. Scraping the root or crushing a leaf will release the carrot odor.

The rough, branched bristly stem seems inappropriate for a flower that is so delicately and exquisitely displayed.

The lacy, white flat-topped umbel is composed of many small florets, or individual flowers. The outer florets are larger but sterile. They may be used as landing spots and to guide insects. The center of the umbel often contains a single deep-purple floret. This may help to direct the attention of visiting insects. It is sometimes said in a fanciful way that this is where Queen Anne pricked her finger whe making lace.

The flower blooms from May to October and opens according to the amount of moisture in the air. Before the flower blooms and after it has gone to seed, it becomes hollow in the center and resembles a bird's nest.

The spiny seeds resemble jewels under a hand lens. The fruit has five bristly ribs with hairs between them. Each fruit is two-seeded and has a supply of oil. The oil is released over the whole umbel when the seeds ripen. This may be an adaptation to keep birds and mice away from the seeds.

The genus and species names are a corruption of a Greek word and a Latin word that both mean "carrot."

The common name can be traced to Queen Anne, wife of James I. It was fashionable at the time for the queen and ladies of the royal circle to decorate their hair with the lacy autumn leaves. The flowers may have been used in the same way.

Science has established that Queen Anne's lace has value in combating bacteria, expelling worms, lowering blood pressure, and as a diuretic. ■

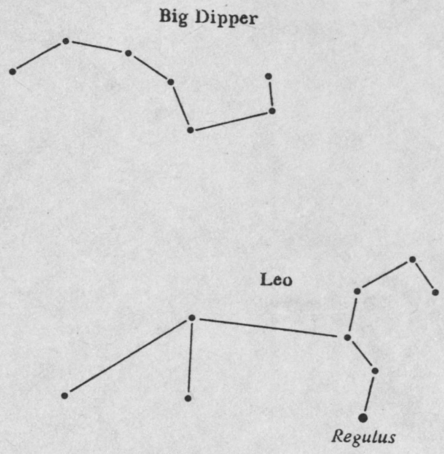
The Night Sky

The Lion in April

by **Francine Jackson**

ALREADY, A QUARTER of the year has come and gone, Easter has just passed, the clocks are getting prepared to be changed, a favored meteor shower is hoping to peak on a clear night (the Lyrids, April 22nd), and Leo the Lion is parading in full view, just waiting to be adored overhead.

One of the few constellations that actually looks like what it's supposed to be, Leo can readily be observed these evenings by facing south and finding what appears to be a backwards question mark, with the brightest star being the dot. Just to the left of the question mark (also called the asterism the Sickle), are three stars forming a right triangle. By joining these two shapes, you probably notice how easily the question mark becomes the lion's head and mane, and the triangle his back legs -- clearly an animal striding majestically across the spring sky.



The dot of the question mark is a very easy star to remember. Its name is Regulus. Those of you who can recall high school Latin may recognize the root word rex, meaning king. Regulus is the king star in the constellation the King of Beasts.

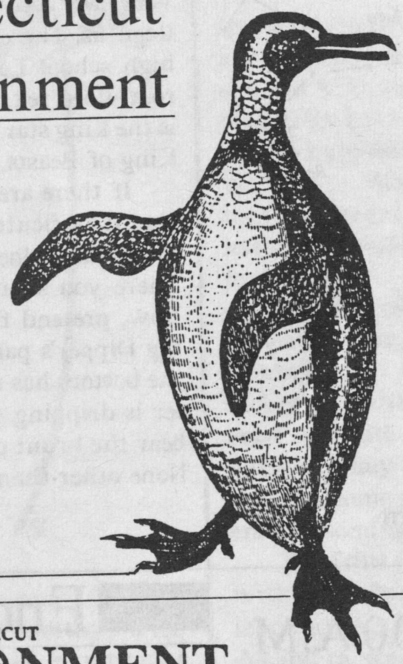
If there are any of you who may find it difficult to see Leo at first: face south and look directly overhead. There you should see the Big Dipper. Now, pretend for a moment that the Big Dipper's pan is full of water, but the bottom has rusted out and the water is dripping downward. Who will bear the brunt of this annoying leak? None other than Leo, the Lion. □

Endnote

As of December 1990, the world's human population was estimated to be 5.36 billion. With the possible exception of some rodent species, *Homo sapiens* is now by far the most numerous mammal on earth; our numbers dwarf even those of domestic cattle (1.25 billion) and hogs (764 million). Among birds, only domestic chickens outnumber us. No reptiles or amphibians come close.

Wildlife Conservation
Magazine

Hey, Bill, did you borrow my copy of Connecticut Environment



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